# PROGRAM REVIEW

## 1986 · 87

## NEWFOUNDLAND FORESTRY CENTRE

Government of Canada Canadian Forestry Service

Gouvernement du Canada Service canadien des forêts

88-04088/

# PROGRAM REVIEW
# 1986-87

## NEWFOUNDLAND FORESTRY CENTRE
## CANADIAN FORESTRY SERVICE
## GOVERNMENT OF CANADA

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# The Canadian Forestry Service
# Government of Canada

The Canadian Forestry Service (CFS) is the principal source of federal expertise in forestry and has been designated as the government's lead agency for forestry matters. Its general objective is to promote the wise management and use of Canada's forest resources for the economic, social, and environmental benefit of Canadians.

The following are the main functions of the CFS:

1. Coordination of federal policies for the promotion of better resource management and forest industry development.

2. Provision of scientific and technological leadership in forestry through research and development.

3. Provision and analysis of national and international statistics and information as a basis for policy formulation.

4. Development and certification of codes and standards for wood product performance.

5. Protection of Canada's forests from foreign pests.

6. Fostering the potential use of the forest resource for energy.

7. Contributing to the environmental objectives of the Government of Canada.

Canadian Forestry Service programs are coordinated with those of other forestry agencies through a variety of mechanisms, including the Canadian Council of Forestry Ministers, the Forest Sector Strategy Committee, management committees for Federal-Provincial Forestry Development programs, national and regional Research Advisory Committees, and various technical committees for specific program areas.

The Canadian Forestry Service is comprised of a headquarters unit, six forestry centres, and two national institutes. The forestry centres are responsive to regional priorities and maintain close liaison with the respective provincial government forestry departments and other clients. They also participate in, and frequently lead, national programs. The national institutes provide the focus for programs of national scope.

# Service Canadien des Forêts
# Gouvernement du Canada

Le Service canadien des forêts (SCF) réunit la majorité des spécialistes fédéraux en foresterie; il a été désigné comme l'organisme officiel du gouvernement responsable du secteur forestier. Son objectif général est de promouvoir l'aménagement et l'utilisation judicieux des ressources forestières du Canada pour le plus grand bien économique, social et environnemental des Canadiens.

Voici les principales fonctions du SCF:

1. Coordonner les politiques fédérales afin de favoriser l'amélioration de la gestion des ressources et l'expansion de l'industrie forestière.

2. Fournir une orientation scientifique et technologique dans le domaine de la foresterie, par la recherche et le développement.

3. Fournir et analyser les statistiques et l'information nationales et internationales qui serviront à établir les politiques.

4. Mettre au point et homologuer des codes et des normes en matière de rendement des produits du bois.

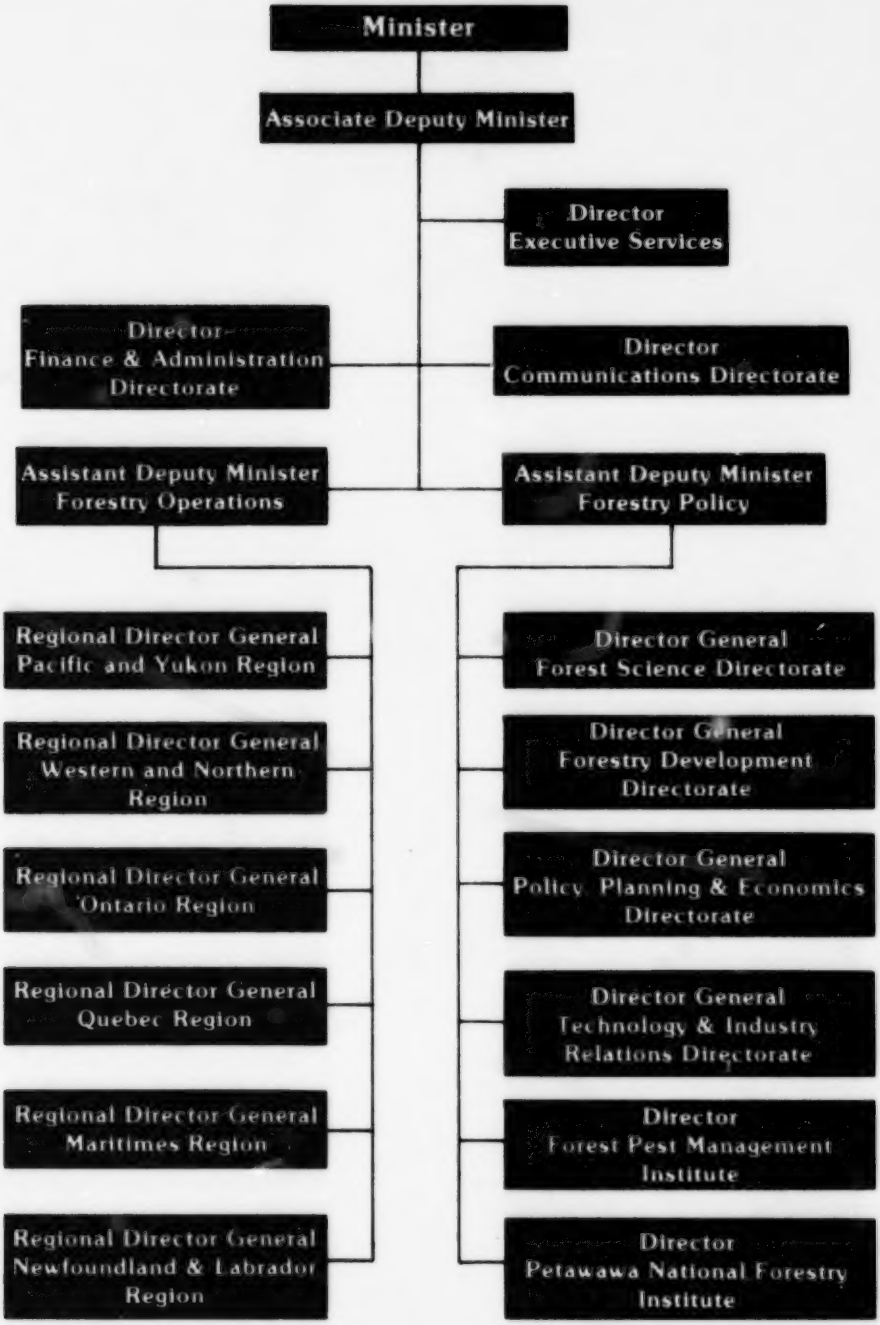
5. Protéger les forêts canadiennes en luttant contre les ravageur étrangers.

6. Parrainer l'utilisation éventuelle des ressources forestières pour la production d'energie.

7. Adhérer aux objectifs environnementaux du gouvernement fédéral.

Les programmes du SCF sont menés de concert avec ceux d'autres organismes forestiers par l'entremise de divers mécanismes dont le Conseil canadien des ministres des Forêts, le Comité de la stratégie forestière, les comités de gestion des programmes fédéraux-provinciaux de développement forestier, les comités nationaux et régionaux consultatifs sur la recherche, de même que divers comités techniques axés sur des domaines de programmes spécifiques.

Le SCF comprend une administration centrale, six centres de foresterie et deux instituts nationaux. Les centres de foresterie doivent répondre aux impératifs régionaux et entretenir une liaison étroite avec les ministères provinciaux des Forêts. Ils participent également à des programmes nationaux dont ils assument fréquemment la direction. Les instituts nationaux sont les foyers des programmes d'envergure nationale.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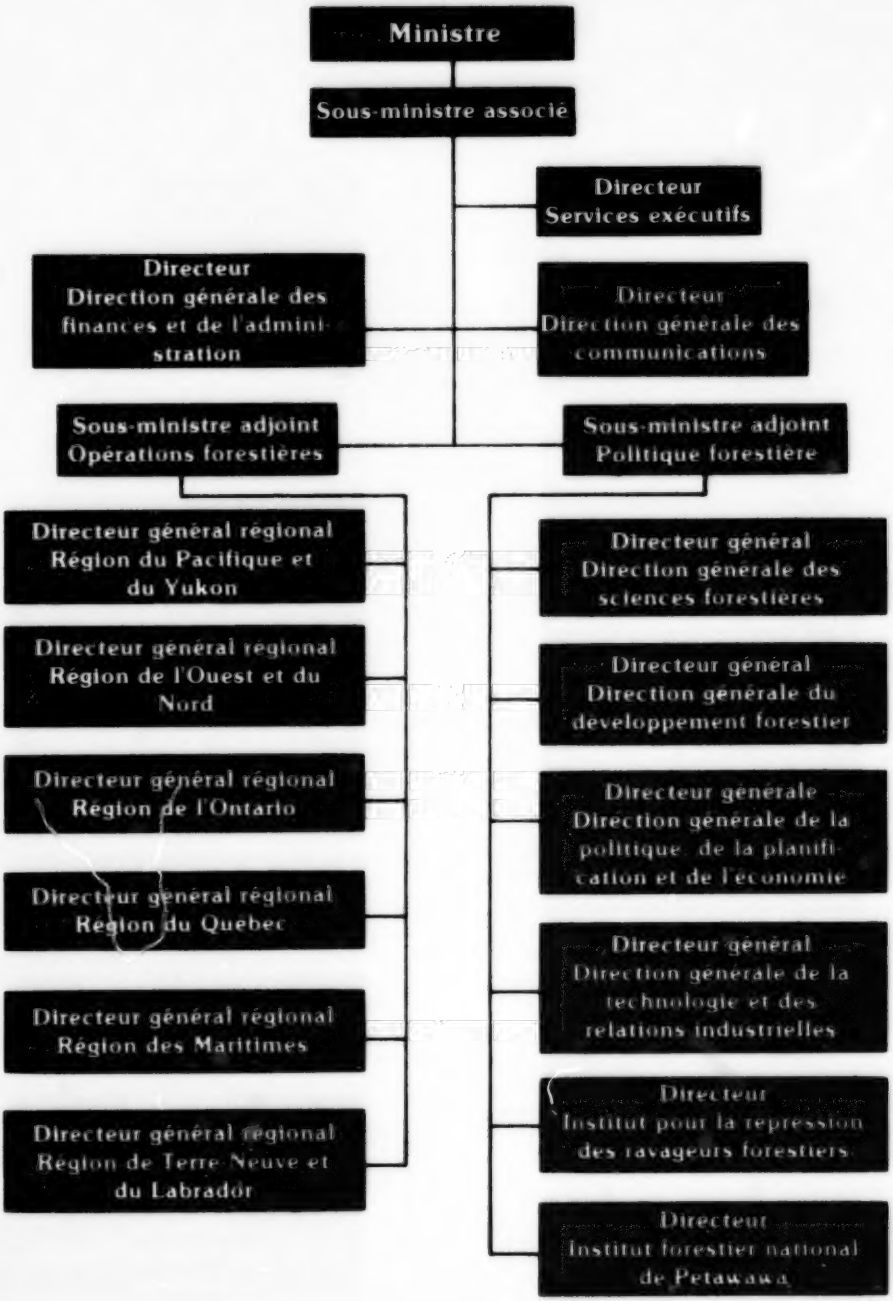
Associate Deputy Minister
Director Executive Services
Director Finance & Administration Directorate
Director Communications Directorate
Assistant Deputy Minister Forestry Operations
Assistant Deputy Minister Forestry Policy
Regional Director General Pacific and Yukon Region
Regional Director General Western and Northern Region
Regional Director General Ontario Region
Regional Director General Quebec Region
Regional Director General Maritimes Region
Regional Director General Newfoundland & Labrador Region
Director General Forest Science Directorate
Director General Forestry Development Directorate
Director General Policy, Planning & Economics Directorate
Director General Technology & Industry Relations Directorate
Director Forest Pest Management Institute
Director Petawawa National Forestry Institute


Ministre
Sous-ministre associé
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Direction générale des finances et de l'administration
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Direction générale des communications
Sous-ministre adjoint
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Institut pour la répression des ravageurs forestiers
Directeur
Institut forestier national de Petawawa

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J. A. Munro

# Newfoundland Forestry Centre

## Foreword

During this review period, the Newfoundland Forestry Centre (NeFC) continued its program of research and development in support of the forest resource of the Newfoundland and Labrador region. Each of our three major programs, Forest Protection research, Forest Resources and Environmental research and Forest Development recorded significant accomplishments.

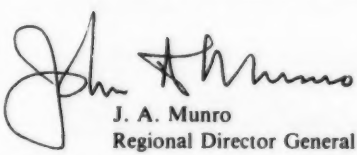
Highlighting our Forest Protection program was the continuation and expansion of a study to test the effectiveness of various insecticides against the hemlock looper. This is a major undertaking involving extensive field testing in close cooperation with industry, Provincial Government, manufacturers of control agents, and the National Forest Pest Management Institute (FPMI).

In the Forest Resources and Environmental research program there was progress in both the reforestation and tree growth projects. New studies on site preparation and on the influence of wind on regeneration were introduced in addition to a study to examine the effect of Kalmia on regeneration processes in black spruce stands.

A new $48 million Canada/Newfoundland Forest Resource Development Agreement was signed with the Province on April 28. This culminated many months of intensive negotiation by the Development staff and provided a means whereby Canada and Newfoundland could financially support intensive forest management initiatives over a four year period. During this first year of the agreement, approximately $10.1 million have been spent primarily on forest improvement, access road construction and the introduction of new technology.

In addition to the research and development activities a good deal of progress was made in improving the various facilities of the Centre. Renovations were made to field stations at Badger, Pasadena and North Pond while the headquarters' buildings in St. John's were renovated to upgrade laboratories and improve staff accommodations.

A general overview of each of the Centre's projects plus a summary of the Centre's financial report, organizational chart and list of publications are provided in this publication.



J. A. Munro
Regional Director General

Program Management

# Program Management

**PROJECT 1111**
**Program Management**
**Project Leader:** J. A. Munro

## Objectives

To ensure efficient planning and management of the research and development activities of NeFC; to ensure that NeFC activities are responsive to regional needs, priorities and concerns of the Government of Canada.

## Achievements Current Year

Highlighting this year's program was the successful implementation of the Canada-Newfoundland Forest Resource Development Agreement (FRDA). Additionally advisory services were provided to the Canada Employment and Immigration Commission on a number of forestry job creation projects. Educational upgrading remained a high priority with three researchers being granted educational leave and a number of staff participating in a variety of university and special training courses.

## Goals for 1987-88

A number of vacant positions are expected to be staffed during the next fiscal year. Continued emphasis will be placed on the Canada-Newfoundland Joint Forest Research Committee with special attention given to negotiating the renewal of the terms of reference of this committee for 1987-88.

**Signing of Canada/Newfoundland Forest Resource Development Agreement on April 28, 1986.**

Finance and Administration

# Finance and Administration

**Project 1211/1221**
**Financial and Administrative Services**
**Project Leader:** R. J. Angel

## Objectives

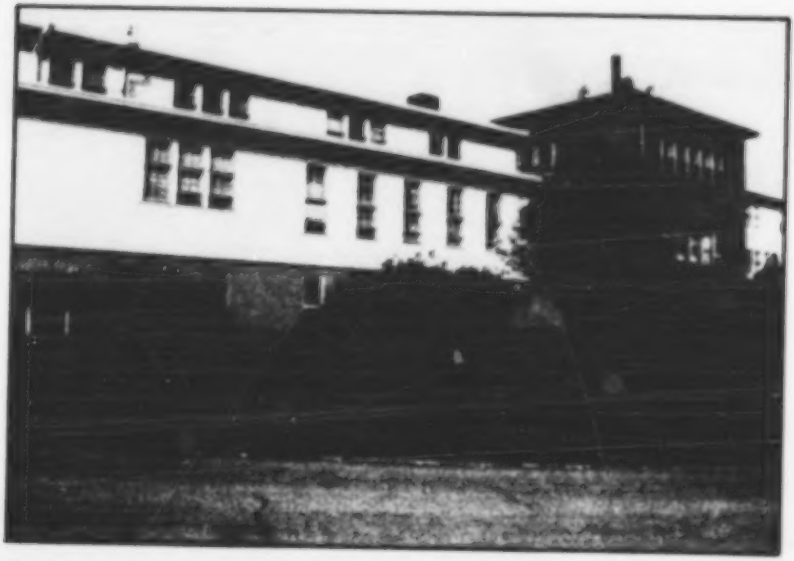
To provide consulting and advisory services to management ensuring internal control of finances and various research support facilities.

## Achievements Current Year

Financial services were provided in support of the Centre's overall program on a regular and on-going basis. Administratively, facilities improvement dominated other activities with considerable renovations being made to field stations at Badger, Pasadena and North Pond. Additionally, renovations to both Headquarter's buildings in Pleasantville were completed.

## Goals for 1987-88

Financial services will implement enhancements to the Financial Management Information System. These enhancements will permit a greater range of financial information to management and users. Administrative goals will involve interfacing the existing Materiel Management Information System with the VAX 8200 and to participate with Headquarters in determining the feasibility of an individual CFS libraries system.



**Headquarters building in St. John's.**

Program Management
and Support

# Program Management and Support

**Project 2111**

**Program Management**

**Project Leaders:** A. B. Case and J. Hu[illegible]

## Objectives

To ensure effective management of personnel and financial resources allocated to research programs and to maintain scientific and technology transfer elements of programs at a high level.

## Achievements Current Year

Reforestation research was expanded to include new studies on site preparation and on the influence of wind on regeneration and stand development patterns. The existing research on tree and stand growth was also expanded to include new initiatives on stand productivity. Additionally a new study on *Kalmia* was introduced and two major site classification workshops were held in central and western Newfoundland. The forest protection research program improved the detecting and forecasting procedures for major forest pests. Work to detect parasitic nematodes continued as well as the research being conducted on cone, seed, plantation and regeneration pests. Research pertaining to the population dynamics of hemlock looper was emphasized and a major effort was expanded in testing the effectiveness of several pest control products on this hemlock looper. The on-going biological control project against the hemlock looper continued with the introduction of parasites and disease organisms and by testing the effectiveness of the locally isolated nematode.

## Goals for 1987-88

Existing research under both research programs will continue. This will be supplemented by a new project in forest renewal and involvement in a new Federal-Provincial initiative on site classification and *Kalmia* research.

Forest Resource and
Environmental Research

# Environmental Assessment of Forestry Practices

**Project 2211**
**Environmental Assessment of Forestry Practices**
**Project Leader:** I. D. Thompson

## Objectives

To determine impacts of forest management practices on terrestrial and aquatic systems; to assess impacts of moose on regeneration; to assess impacts of forest harvesting on moose habitat and to provide advice to other agencies as required.

## Achievements Current Year

A survey of thinned and unthinned balsam fir stands across the island was completed and a reassessment of moose browsing plots which were established in 1953 was started as were studies into the habitat requirements of moose in winter.

## Goals for 1987-88

Investigations of timber harvesting effects on moose and site consideration for a future study on buffer strips will be continued. A study on the impact of moose on succession will be completed and the second phase of successional studies will be initiated.

### List of Studies

Services to the Federal Environment Assessment and Review Office (FEARO), Regional Screening Coordinating Committee (RSCC) and environmental agencies.

Guideline development for buffer strips.
**Leader** - I. D. Thompson

Improved multiple use forestry related to wildlife.
**Leader** - I. D. Thompson

Effects of moose on forest regeneration
**Leader** - I. D. Thompson

Sensitivity of land to forest practices.
**Leader** - A. R. van Kesteren

# Forest and Plant Ecology

**Project 2214**
**Forest and Plant Ecology**
**Project Leader:** W. J. Meades

### Objectives

To determine the ecological relationships among major vegetation types of Newfoundland and Labrador and their natural environments; to provide a general system of site classification for forest and wildland habitats in Newfoundland and Labrador to assist resource managers in determining priority utilization for various resource development scenarios; to develop means of predicting gross successional changes in vegetation due to natural or human disturbances; to increase knowledge of the autecology of species having particular importance in Newfoundland and Labrador; to apply the data bank generated from such studies to forest and other land management problems; to provide national and international leadership and technology transfer in the development of ecological land classification systems.

### Achievements Current Year

Meteorological instrumentation as well as additional instruments to measure depth to the soil aerobic/anerobic zone were established on the peatland afforestation trial in central Newfoundland. Foliar nutrient and height/diameter data were obtained from a peatland afforestation trial at Millertown and the peatland forestry plantation at Stephenville was remeasured and fertilized. A study to monitor succession of a black spruce-moss forest type was established and a vegetation classification of disturbed sites in western Newfoundland was initiated with 24 sites being located and described.

Fen

Heathland afforestation

## Goals for 1987-88

The peatland afforestation experiment in central Newfoundland as well as the supplementary trials at Millertown and Stephenville will be monitored. Also, site classification of disturbed forest sites in western Newfoundland will continue as well work on seed dispersal and seedling survival. Development of a forest site classification manual will be initiated with the Department of Forest Resources and Lands and a comprehensive soils research proposal to integrate soil studies with other phases of forest production research at the Centre will be developed.

## List of Studies

Ecological investigation of wetlands for forestry.
**Leader** - E. D. Wells

Ecological investigations of heathlands.
**Leader** - W. J. Meades (A. Mallik - visiting fellow)

Forest classification, ecology and mapping.
**Leader** - W. J. Meades, A. R. van Kesteren

Autecological studies of major trees, shrubs and related vegetation.
**Leader** - B. A. Roberts

Ecology of Newfoundland soils.
**Leader** - B. A. Roberts

# Reforestation

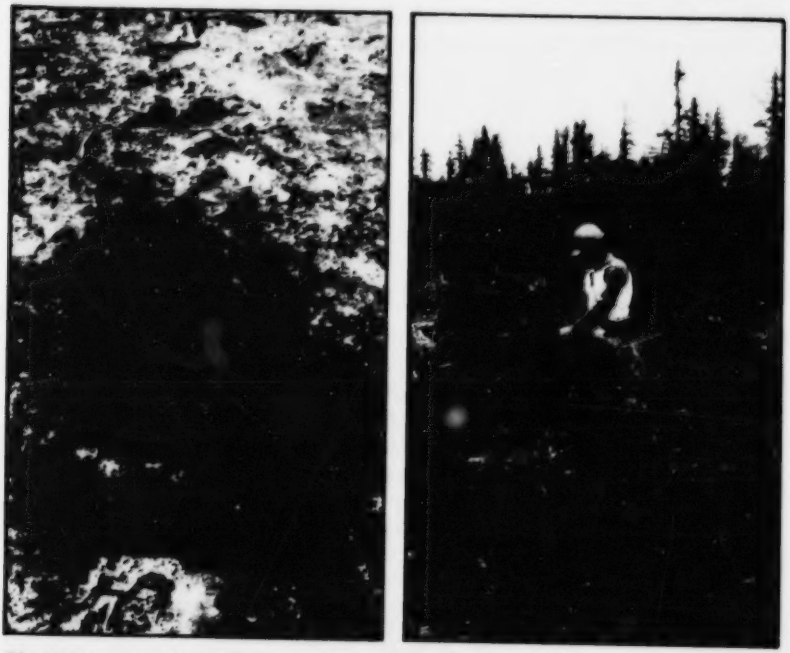
**Project 2222**
**Reforestation**
**Project Leader:** B. D. Titus

## Objectives

To develop a methodology for determining seedling stocking and density relationships for black spruce and mixed black spruce - balsam fir seedling populations on recently disturbed sites; to determine the influence of site preparation on planting position microenvironment and subsequent seedling growth; to determine the performance of planting stock type and planting stock quality across a range of sites in Newfoundland; to determine optimum softwood potential by matching species and provenance with site, and by genetic improvement of softwoods through hybridization; to assess the effect of competition control on early softwood growth.

## Achievements Current Year

Comprehensive statistical analysis of stocking survey methodology data continued. The site preparation study proposal was refined. An extensive field trial comparing two methods of mechanical site preparation with untreated areas was established; soil microenvironmental conditions following removal of slash, and slash plus the lit-



**Planting containerized black spruce in central Newfoundland.**

ter layer were monitored over the growing season; a greenhouse study on soil media produced by site preparation techniques was begun. A proposal for initiation of a collaborative *Kalmia* site reforestation trial was developed. Five-year assessments were completed on ten planting stock comparison and four planting stock quality trials; a comprehensive literature search was completed, and a first draft report commenced. Four larch species/provenance trials were established; black spruce inbreeding study was completed; three species/provenance trials and four heathland afforestation field trials were remeasured. Data from 1984 remeasurements on two herbicide trials (North Pond and South Brook Valley) were analysed in conjunction with the Department of Mathematics and Statistics of the Memorial University of Newfoundland (MUN). The Silvicultural Trials and Demonstration study was formally terminated.

## Goals for 1987-88

To conclude study on regeneration survey methodology for recently disturbed sites, prepare a draft manuscript and communicate results to client agencies. Plant up mechanical site preparation field trials that were scarified in the summer of 1986; begin monitoring of planting position microenvironment (soil temperature, moisture, nutrient availability) at trial site. Conclude data analysis for planting stock comparison and planting stock quality trials, and write up five year results. Conclude data analysis for aerial seeding trial and write report. Develop in conjunction with the new research scientist responsible for forest genetics comprehensive studies, with emphasis on hybridization in boreal adapted conifers; variation patterns within species; economic analysis of tree improvement; factors affecting and manipulation of seed yields. Conclude data analysis for competition studies (1975-84 results for North Pond, 1978-84 results for South Brook Valley) and write reports; maintain study sites to facilitate future remeasurements.

## List of Studies

Competition control on forest sites.
**Leader** - B. D. Titus

Influence of biometeorological factors on forest productivity.
**Leader** - A. W. Robertson

Survey methodology and seedling stocking density relationshps in black spruce and black spruce-balsam fir populations.
**Leaders** - P. F. Newton, J. M. Butler

Silvicultural workshops and demonstrations.
**Leaders** - B. D. Titus, V. D. Chaffey

Plantation research.
**Leaders** - B. D. Titus, V. D. Chaffey

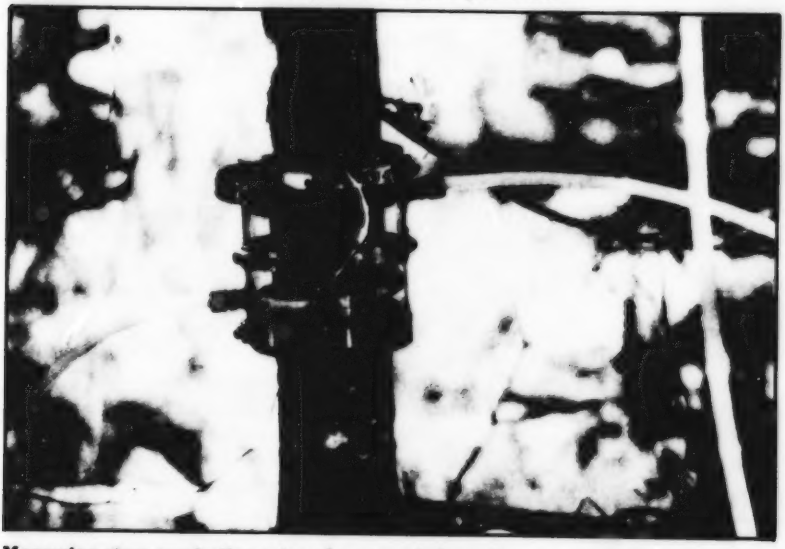
Site preparation research
**Leader** - B. D. Titus

# Tree and Stand Growth

**Project 2223**
**Tree and Stand Growth**
**Project Leader:** M. B. Lavigne

## Objectives

To examine and assess the processes involved in tree growth and stand development for each commercially important tree species as a basis for incorporating site and stand factors into growth and yield models; to cooperate with the other major forest agencies in this province in setting out silviculture field trials for the purpose of producing good quality growth and yield data in the future; to interface with forest agencies to ensure effective transfer of research information and knowledge on data collection, tree and stand development and yield prediction.



**Measuring stem respiration rates of a young balsam fir.**

## Achievements Current Year

One precommercial thinning spacing trial was remeasured. Soils were described at four spacing trials and samples were collected for nutrient analysis. A report has been prepared based on results of the remeasured spacing trial for dissemination to collaborating agencies. Two spacing trials in black spruce plantations were established. An experiment to study interactions of light, water and nutrients on growth of balsam fir trees was established. The treatments of this study involved various combinations of trenching, droughting, irrigating and fertilizing. A study was began to compare moisture relations and growth of balsam fir and black spruce on contrasting sites. In a study relating tree growth to spatial arrangement and stand density, field work and laboratory work were completed, and data analysis was begun.

The data has been used to analyze seven-year growth responses in a black spruce stand. Advice on data collection, plot design and stand selection was provided to the Provincial Department of Forest Resources and Lands on a proposal to establish a set of permanent sample plots in managed and unmanaged stands.

### Goals for 1987-88

To remeasure the precommercial thinning spacing trial at Cormack. To establish two plantation spacing trials. To establish a precommercial thinning spacing trial. To continue describing soils and collecting samples for nutrient analyses at established spacing trials. To calibrate a model that relates stand density, spatial arrangement of trees and tree growth, and use this model to evaluate growth in a precommercially thinned black spruce stand. To analyze stem form in relation to stand density and spatial arrangements of trees, possibly leading to taper-based volume equations. To evaluate new methods for stem analysis. To prepare a final report of growth responses to fertilization in black spruce stands.

### List of Studies

Influence on stand density and fertilization on productivity of natural and planted softwoods.
**Leaders** - M. B. Lavigne, R. S. van Nostrand

Production process in balsam fir stands.
**Leader** - M. B. Lavigne

Development of a stand density management model for pure black spruce forest types within central insular Newfoundland.
**Leader** - P. F. Newton

Advisory services to forest agencies.
**Leader** - M. B. Lavigne

# ENFOR (ENergy from the FORest)

**Project 2241**
**ENFOR (ENergy from the FORest)**
**Project Leader:** R. S. van Nostrand

### Objectives

To determine the technical and economic feasibility of using forest biomass for energy production in Newfoundland; to assist the Department of Forest Resources and Lands (DFRL) in developing long term strategies for the utilization of biomass for energy; to cooperate with DFRL in developing methods and techniques for biomass inventory and management; to assess environmental impacts of biomass harvesting and methods of reforestation.

**1 year old willows at Pasadena Nursery.**

## Achievements Current Year

The *Salix* energy plantation work continued. Replicated experiments on two of the test blocks were replanted and infill was carried out on all test blocks. The Glenwood test block was enlarged to 4 ha and baseline biometeorological data were collected during July and August. A study of photosynthetically active radiation and leaf development in a *Salix* energy plantation was completed. Field and laboratory work for calibrating the FORCYTE 11 growth model for selected balsam fir sites in western Newfoundland continued. FORCYTE 10 was installed and tested in the NeFC VAX computer system. The fourth and fifth planting of softwood seedlings on sites recently harvested for hardwood biomass fuel was completed.

## Goals for 1987-88

To infill and weed the *Salix* test blocks; to further test the energy balance system on a newly planted area of the Glenwood test block; to continue analyses of studies of correlations between growth patterns and climatic variables; to develop a model to assess the competitive position of fuelwood from proposed energy plantations in Newfoundland, vis-a-vis alternative fuels. To complete collection and analyses of data for calibrating the FORCYTE 11 growth model; install and test FORCYTE 11 on a microcomputer; conduct a workshop in Newfoundland on FORCYTE 11. To record appropriate ecological and growth data and complete the sixth and final planting of softwood seedlings on a hardwood site harvested for fuel. To develop ENFOR project proposals for 1988-89.

## List of Studies

Reforestation after whole-tree chipping for hog fuel.
**Leaders** - R. S. van Nostrand, V. Chaffey

Boreal energy plantation R & D.
**Leaders** - A. W. Robertson, C. French

Calibrating the FORCYTE growth model for Newfoundland forest types.
**Leader** - W. J. Meades

# Pest Biology Research

**Project 2232**
**Pest Biology Research**
**Project Leader:** A. G. Raske

## Objectives

To develop effective and practical methods for measuring population levels of forest pests and their natural control factors. To investigate the biology of pest insects and diseases including their population dynamics. To assess insect and disease impacts on major age classes of forest trees and stands. To develop methods to prevent or minimize forest losses.

**Spraying virtuss virus against the white-marked tussock moth.**

## Achievements Current Year

A cooperative project with Forest Pest Management Institute (FPMI) continued to identify and synthesize the pheromones of the spruce coneworm and the spruce seedworm. Juvenile hormones were sprayed against the balsam woolly aphid and the results are being analyzed. Five candidate compounds for the hemlock looper pheromone were tested for field attractiveness of males in Newfoundland in 1986. None of the compounds tested was attractive to males. The root systems of balsam fir trees that survived the spruce budworm attack were exposed and examined for Armillaria root rot. The root rot was present but its severity was low in recovering trees. Studies on the identification of the congregating pheromone of the four-eyed spruce bark beetle were nearly completed. Data on the within-tree distribution of hemlock looper eggs has been collected, and sample units determined. A dynamic se-

quential simulation model has been constructed to evaluate the looper egg within tree distribution. Less than 2% of hemlock looper larvae and pupae were parasitized in 1986 but looper mortality by fungi varied greatly by locality, reaching up to 20% of the samples. Growth loss curves for selected trees in light, moderate and severe categories of cumulative spruce budworm damage were determined. Ground application of a virus to white-marked tussock moth infestation was generally successful in that larval populations were reduced several weeks after treatment. Sumithion and Dimilin was retested in 1986 for hemlock looper control. Airplanes were not available at first and prevented early applicatons of insecticides. Both the water-base formulation of Sumithion at 180 g ai/ha and the oil base formulation at 210 g ai/ha gave good control. Also two applications of Dimilin at 70 g ai/ha at 4.7 /ha and at 2.5 /ha gave good control. Dimilin treatments provided little foliage protection and Sumithion provided partial foliage protection. Dimilin sprayed unto ombromorphic bog pools decreased population of planktonic arthropodas and dragon fly nymphs at least temporarily, but did not evidently affect midge larvae nor damsel flies, true aquatic bugs nor aquatic beetles. Dimilin sprayed in late summer prevented rebound of population which had occurred in other studies when Dimilin was sprayed in early summer.

## Goals for 1987-88

To continue germination tests of seed from insect damaged cones and to continue studies of the biology, including pheromones, of seed pests. To continue studies on midge ecology and its chemical control with systemic insecticides. To examine the sampling system for the balsam woolly aphid and formulate plans for direct control experiments and for assessing impact on growth of thinned stands. To continue efforts to identify the sex pheromone of the hemlock looper (contract research). To report the investigation of the distribution and severity of *Armillaria* in the roots of balsam fir damaged by the spruce budworm in the same stands sampled in 1981 and 1986. To continue studies of deterioration of black spruce and the associated microflora and insect activity. To investigate wood losses due to blowdown and subsequent deterioration in insect damaged stands, and to continue sampling utility poles for active decay. To continue analysis of the data base to identify site and stand variable for a natural stratification of cull regions in Newfoundland. To finalize studies on the impact of the four-eyed spruce bark beetle on damaged black spruce. To continue the process of identifying the pheromone of the four-eyed spruce bark beetle. To continue monitoring spruce budworm population and their natural control factors. To continue growth-ring analyses of budworm-damaged trees and establish plots to quantify impact of hemlock looper defoliation. To collate data on the quantity of moose browse at permanent sample points. To remeasure permanent plots for determining changes in forest succession. To determine the fate of Dimilin in aquatic ecosystems and in soils (contract research). To test a new formulation of fenitrothion, Dimilin and *B.t.* against the hemlock looper.

## List of Studies

Factors damaging to cone crops.
**Leader** - R. J. West

Damage from balsam woolly aphid.
**Leader** - E. J. Dobesberger

**Red squirrel trap**

Sex pheromone(s) of the eastern hemlock looper.
**Leader** - K. P. Lim

Armillaria root rot.
**Leader** - Vacant

Deterioration of insect damaged trees.
**Leader** - G. R. Warren

Decay and wood quality of living trees.
**Leader** - G. R. Warren

Role of woodborers and bark beetles in tree mortality and deterioration.
**Leader** - W. W. Bowers

Population studies of major defoliators.
**Leader** - E. J. Dobesberger

Biocontrol factors of major defoliators.
**Leader** - K. P. Lim

Impact of major defoliators.
**Leader** - A. G. Raske and E. J. Dobesberger

Impact of spruce budworm on forest succession.
**Leader** - W. J. Meades

Plantation and regeneration insects.
**Leader** - R. J. West

Effectiveness of insecticides.
**Leaders** - A. G. Raske, R. J. West and K. P. Lim

Food storage compounds in relation to defoliation.
**Leaders** - A. G. Raske and M. B. Lavigne

# Biological Control Research

**Project 2234**
**Biological Control Research**
**Project Leader:** K. P. Lim

## Objectives

To develop effective biological control of forest pests. To evaluate the effect of chemical insecticide(s) on biological control agents of forest pests. To investigate the potential use of entomogenous nematodes as biological control agents of forest pests.

## Achievements Current Year

Additional NPV virus was introduced from FPMI and all known local infestations of the European pine sawfly treated. The virus was applied late and mortality peaked as larvae began to pupate. In 1986 all mountain-ash sawfly larvae at the release site of the parasite *Olesicamp geniculatae* were parasitized, and the parasite was recovered from sawfly larvae nearby. Sawfly samples from five other locations in St. John's were without parasites. A total of 17% of birch casebearer larvae at the release site were parasitized by the introduced parasite in 1986. Nematodes remained infective to hemlock looper larvae on foliage when water, stove oil (1%, 5%), vegetable oil (1%, 5%), or glycerin (2%) were used as carriers for the nematodes. Infectivity rate varied with looper instar, nematode species and carrier. Combining all results it appears that the most effective formulation is the nematode LIC in 5% vegetable oil applied to third and fourth instar larvae. The pinewood nematode was not found on all the insect vectors collected in 1986. However, this nematode was recovered from wood samples in four new locations in Newfoundland: 15 km W. Glenwood (TCH) and Lake Ambrose in central Newfoundland; Pinchgut Lake and west end of Grand Lake in western Newfoundland. The nematode was in dead fir at these locations except at Lake Ambrose where it was in healthy larch.

## Goals for 1987-88

Larval parasites of the *mountain-ash sawfly* will be monitored for dispersal. *Hemlock looper* - The effectiveness the introduced tachinid, *W. occidentalis*, will be monitored. Provide scientific authority on research contracts on entomogenous nematodes.

## List of studies

Populations of biological control agents.
**Leader** - K. P. Lim

Control of forest insect pests with nematodes.
**Leader** - K. P. Lim

Effect of insecticides on parasites of hemlock looper.
**Leader** - K. P. Lim

# FIDS (Forest Insect and Disease Survey)

**Project 2311**
**FIDS (Forest Insect and Disease Survey)**
**Project Leader:** J. Hudak

## Objectives

To conduct annual surveys of forest pest conditions, determine the extent of infestations, assess the impact, forecast impending conditions, and recommend control measures and when necessary evaluate the effectiveness of direct control measures. To provide forest pest data and related information for the National Forest Resource Data program of Canada and other national and regional reports.

## Achievements Current Year

The annual general detection, monitoring, appraisal and forecast of forest insects and diseases have been completed, the data analyzed and interpreted, and presented to forest resource managers in the form of publications, reports, and at special seminars and meetings. Data from the above surveys provided resource managers with the information necessary to evaluate the problem and to plan and conduct the control action necessary. Information on many forest pests was provided including details of the three important pests in 1986; the hemlock looper, the spruce budworm, and the balsam woolly aphid.

The hemlock looper replaced the spruce budworm as the most important defoliating pest of Newfoundland's forest. Populations continued at outbreak levels in several areas of the Island though the size of the outbreak decreased on the Avalon Peninsula and in central Newfoundland, the area of infestation increased in western Newfoundland. Defoliation was recorded on about 332 000 ha with 215 000 ha in the moderate and severe category. The egg survey method was improved and considerable increase in infested area is forecast for 1987. Moderate and severe defoliation is expected on 327 000 ha and light defoliation on 132 000 ha for a total of 459 000 ha.

Spruce budworm larval sampling in 1986 showed high budworm numbers at three locations on the Island and severe defoliation occurred on about 4000 ha with 2200 ha in the moderate and severe category. Generally, field sampling in 1986 showed an overall increase in budworm numbers. Forty-four permanent sample sites were located for annual monitoring of budworm populations with sex-pheromone traps.

Four hemlock looper defoliation-damage plots were established in western and central Newfoundland in light, moderate and severe defoliation stands to follow the progress of looper damage.

Branch samples were collected across the Island to adopt a method for counting balsam woolly aphids in immature thinned and natural stands.

Special pheromone-trap surveys were conducted in cooperation with Agriculture Canada to monitor the possible introduction of the gypsy moth and forest land caterpillar. No gypsy moth and no forest tent caterpillar moths were caught in traps in Newfoundland in 1986.

A special survey was conducted in cooperation with Memorial University to determine the distribution of parasitic nematodes in forest trees.

Several experimental plantations of sitka spruce were examined for Scleroderris canker throughout the Island. This disease continued to spread in St. John's with several new infection sites located, but the intensity of infestation was generally low. Permanent sample plots established for the early detection of acid precipitation were monitored throughout central and eastern Newfoundland.

FIDS staff assisted in testing the effectiveness of fenitrothion, and dimilin against the eastern hemlock looper and in developing a sampling system for forecasting hemlock looper defoliation.

## Goals for 1987-88

Continue surveys for detecting, appraising and forecasting forest pest conditions in general and with special emphasis on spruce budworm, hemlock looper, balsam woolly aphid, Scleroderris canker, and general pest conditions in forest improvement areas. Disseminate information to forest agencies and the general public through written papers, reports, seminars, workshops and verbal communications. Provide information on forest pests for inclusion in national publications.

## List of Studies

Detection and forecasting forest pest conditions.
**Leaders** - L. J. Clarke, G. C. Carew

**Pest conditions on plantations are continuously being monitored by FIDS Rangers.**

# Program Management

**Project 3111**
**Program Management**
**Project Leader:** J. M. Butler

### Objectives

To provide management and common support services to the Forestry Development Branch at NeFC, to recruit and train appropriate staff to discharge the development responsibilities of the branch.

### Achievements Current Year

During this period the economic analyst resigned. The position was subsequently successfully filled. In addition, three contracts were let to provide professional services in support of the Canada-Newfoundland Forest Resource Development Agreement.

### Goals for 1987-88

The organizational change will take place in the Forestry Development Branch. The Economics unit which previously reported to the Program Director, Forestry Development will now report to Regional Director General.

# Agreement Administration (CFS Resource)

**Project 3251**
**Agreement Administration (CFS Resource)**
**Project Leader:** J. M. Butler

### Objectives

To discharge federal responsibilities for the implementation and evaluation of Forestry Agreements in Newfoundland; to facilitate the transfer of new technology into the forestry sector in Newfoundland and to implement forestry job creation programs as required.

### Achievements Current Year

FSA II was completed in this year. Approximately $1.3 million was spent in 1986/87 bringing the total amount spent under the Agreement to $63.35 million. Over the course of the Agreement, the major accomplishments included the silviculture treatment of 43 700 ha, the construction of 700 km of access roads, the construction of a forest protection centre, and the acquisition of a geographic information system. In addition, the Agreement provided for 5,000 short term jobs or 41,000 work weeks of employment. Under the new FRDA approximately $10.1 million has been spent on

intensive forest management projects, operational research and development, and Agreement administration, communications, and evaluation. A Forest Management Information System has been developed for the new FRDA. Forest Development staff continued to be actively involved in the transfer of technology from outside Newfoundland, particularly in the areas of silviculture, forest products development, access roads construction, and forest inventory. The CFS involvement in the EIC Job Development Program was terminated this year. Under the program, 10 forestry projects valued at a total of $1.5 million were completed. About 4,000 weeks of employment were created while 750 ha of silviculture work was undertaken.

### Goals for 1987-88

To continue management and evaluation responsibilities for FRDA. Approximately $12.5 million will be spent on intensive forest management projects, operational research and development, and Agreement administration, communications and evaluation. Refine the Forest Management Information System for FRDA. Continue to assist in the transfer of technology from outside Newfoundland, particularly in the areas of silviculture, forest products development, access roads construction, and forest inventory. Develop terms of reference for the evaluation of FRDA. Continue involvement in forestry jobs creation programming as required.

### List of Studies

Agreement implementation.
**Leader** - J. M. Butler

Agreement technology transfer.
**Leaders** - J. M. Butler, W. L. Alexander, L. West

Agreement evaluations.
**Leaders** - D. Hayden, W. L. Alexander

# Advice and Consultation Services

**Project 1333**
**Advice and Consultation Services**
**Project Leader:** D. Hayden

### Objectives

To establish sound programs for the development of the province's forest resources by providing advice on economic issues and planning to government agencies, both within and outside the CFS, and private firms.

### Achievements Current Year

The principal accomplishment of the project has been to provide written and verbal advice on economic issues, public policy and planning to the provincial Department of Forest Resources and Lands, provincial Department of Mines and Energy, research and regional development programs of the CFS, newsprint mills and other firms as requested. In addition, the CFS's regional economists have provided information on related subjects through interviews with the media and articles published in the NeFC's newsletter.

### Goals for 1987-88

To advise clients on forestry issues involving economics, policy and planning as requested and, to develop a comprehensive planning system and strategic plan for the research and development program at the NeFC.

### List of Studies

Advice and consultation service (study statement same as project statement - no study statement prepared.)

# Economic Studies

**Project 1334**
**Economic Studies**
**Project Leaders:** D. Hayden, G. Milne

### Objectives

To conduct economic research on specific resource and industrial problems and opportunities in the region; to provide input to the national forest economics program; to act as the regional liaison for the national statistics program.

### Achievements Current Year

A study on the economic effect of damage by the spruce budworm on the province's forest resource was published. An additional economist was hired and the senior economist completed his Ph.D. program.

### Goals for 1987-88

A long term program of economic research will be developed and regional input to the national forest economics program will continue.

### List of Studies

Short-term economic analyses.
**Leader** - D. Hayden

Forest resource economics research.
**Leader** - G. R. Milne

Forest industry economics research.
**Leader** - D. Hayden

Information and Technology

# Information and Technology Transfer Services

## Information and Technology Transfer Services

**Project 2313**
**Information and Technology Transfer Services**
**Project Leader:** D. R. Rex

### Objectives

To conduct an effective public relations program designed to increase awareness of CFS and its related activities within the Newfoundland and Labrador region; to provide technical advice and support to management and individual officers on all aspects of publication production and oral/written presentations; to provide advice and support to both public and non-government groups/committees on matters specific to forestry and related forestry matters.

**Forestry Exhibition, Grand Falls.**

### Achievements Current Year

During this reporting period, the Communications Unit has responded to approximately 2500 individual requests for general information. Additionally 400-500 requests for technical information was received. Many of these requests were referred to scientific staff for additional action. The Centre's exhibit program continued as in past years with displays set up in a number of schools, malls and parks. These events were highlighted during National Forest Week and during the Provincial Forestry Exhibition. Work was completed in preparation for the signing of the Canada-Newfoundland Forest Resource Development Agreement (FRDA) which involved the preparation of communication plans, briefing materials for media, press

releases, speaking notes for Minister and logistical arrangements. Editorial and publication production as well as committee participation in support of the NFPA, CIF, FEDC and FSA continued on a regular basis. Four editions of Woody Points were published and a brochure outlining the activities of the NeFC was finalized. A biographical booklet of staff was prepared and the 1984-85 Program Review was published. The text of the Canada-Newfoundland Forest Resource Development Agreement (FRDA) was published and a brochure describing highlights prepared. A number of brochures produced jointly by CFS and the Department of Forest Resources and Lands received editorial input. Visits to schools and youth organizations continued at a reduced rate; however, support to educational committees increased and included active involvement in the province's environmental education program through the provision of project funds and conducting a two day seminar workshop for the Elementary Teachers Council of Newfoundland.

## Goals for 1987-88

Editorial support services will continue as required with an additional requirement anticipated in support for FRDA publications. Static displays for major facilities will be further developed and a joint project with Parks Canada involving exterior displays will be initiated. Committee work will continue and expanded to include support to the Province's 4H organizations. Technical assistance will be provided to all cooperating agencies and general public groups as requested. Liaison activities with client agencies will be increased and a video production project recording all major CFS research projects initiated.

## List of Studies

Public information/media relations.
**Leader** - D. R. Rex

Publication/editorial services.
**Leader** - D. R. Rex

Extension services.
**Leader** - D. R. Rex

General Research
Support Services

# General Research and Technical Support

**Project 2251**
**General Research and Technical Support**
**Project Leaders:** A. B. Case and J. Hudak

## Objectives

To provide an efficient and high quality support service to meet the needs of the NeFC research and development program.

## Achievements Current Year

(1) *Seed and Plant Stock Service* - Produced research plantings for three Salix energy plantations and maintained native and exotic transplants for the tree improvement project.

(2) *Chemical and Physical Analyses Laboratory* - Provided soil and vegetation analysis services to in-house researchers; conducted water analyses for NDOE and EPS.

(3) *Plant Herbarium* - Backlog of vascular specimens has been accessioned; a vascular checklist was published.

(4) *Greenhouse Facility* - Required arctic coolers for large experimental chamber; provided maintenance services for ongoing research experiments at the greenhouse.

(5) *Computer Services* - Demand for computer services increased greatly in 1986 and also included responsibilities in the finance and administration areas. A new VAX 8200 has been purchased with appropriate software and has been operational since summer of 1986. A manual was prepared and a seminar was held on applied linear regression analysis.

(6) *Mycological Herbarium* - Many disease samples have been identified and new additions have been made. Also the slide collection has been improved by new additions or better replacements. The whole herbarium was curated bringing all nomenclature up to date and cataloguing all material.

(7) *Insect Reference Collection* - New additions were made to the collection of the native forest insect fauna of the Island. Special cataloguing was completed to enable quick referencing to any species. Many new seed and cone insects were added because of the recent emphasis on insects affecting tree reproduction.

## Goals for 1987-88

(1) *Seed and Planting Stock Supply Service* - To maintain research nursery transplants for *Salix* energy and tree improvement projects. Provide landscaping service and transplant material for improvements to NeFC properties.

(2) *Chemical and Physical Analyses Laboratory* - Continue the soil analyses service to in-house researchers.

(3) *Plant Herbarium* - To publish non-vascular checklist; to improve and maintain the reference collection and expand the herbarium.

(4) *Greenhouse Facility* - To continue greenhouse services for ongoing research.

(5) *Computer Services* - To maintain the new VAX 8200 computer system and to train staff to use the new system. To increase research software available for the new system. To provide electronic data processing for staff and to advise on computing methods. Develop a five year information strategy plan for NeFC.

(6) *Mycological Herbarium* - To continue to enlarge and improve the herbarium, and the slide collection of forest diseases of Newfoundland.

(7) *Insect Reference Collection* - To continue to improve and expand the regional insect reference collection.

## List of Studies

Seed and planting stock supply service.
**Leader** - W. J. Curran

Chemical and Physical Analyses Laboratory.
**Leader** - E. M. Pike (Acting)

Plant herbarium.
**Leader** - S. M. Morgan

Greenhouse facility.
**Leader** - G. J. Mills

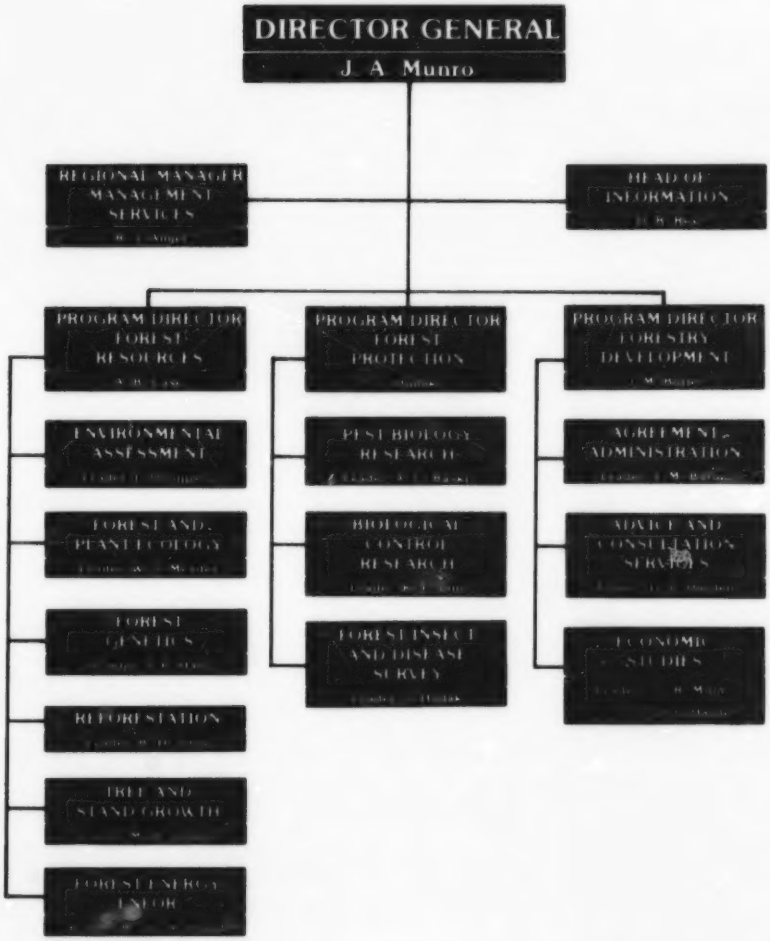
Computer services.
**Leader** - R. G. Hunter

Mycological herbarium.
**Leader** - G. C. Carew

Insect reference collection.
**Leader** - K. E. Pardy

Appendices

# Newfoundland Forestry Centre
# Program Organization



## Staff List and Organization 1986-87

Director General - Dr. J. A. Munro — Secretary - E. E. Manuel

### Forest Resources and Environmental Research

Program Director - A. B. Case

| | | | |
|---|---|---|---|
| Chemical and Physical Analyses Laboratory | — | ..... | E. M. Pike, G. Waterman |
| Forest Ecology | — | Site/Succession ..... | W. J. Meades, A. R. van Kesteren |
| | — | Soils/Autecology ..... | B. A. Roberts |
| | — | Wetlands ..... | E. D. Wells, S. M. Morgan |
| | — | Impact Assessment ..... | I. D. Thompson |
| | — | Herbarium ..... | S. M. Morgan |
| Growth and Yield | — | Ecophysiology/ Stand Modelling ..... | M. B. Lavigne |
| | — | Stand Development ..... | P. Newton, L. May |
| | — | Mensuration/Biomass ..... | R. S. van Nostrand, J. G. Donnelly |
| | — | Biometeorology ..... | A. W. Robertson, C. T. French |
| Forest Renewal | — | Tree improvement/genetics . | J. P. Hall, W. Curran, P. Tricco |
| | — | Site Preparation/ Stand establishment ..... | B. D. Titus, V. Chaffey |
| | — | Nursery Services ..... | C. H. Evans |
| | — | Greenhouse/Special Projects | G. J. Mills |

### Forest Protection Research

Program Director - Dr. J. Hudak

| | |
|---|---|
| Insect Populations ..... | E. J. Dobesberger, J. Carter |
| Cone, Seed and Plantation Pests ..... | R. J. West, D. S. Durling |
| Bark Beetles ..... | W. W. Bowers, J. W. Marshall |
| Damage and Impact ..... | A. G. Raske, J. D. Rowe |
| Biological Control ..... | K. P. Lim, L. Oldford, P. Dixon |
| Mycology, Pathology ..... | G. C. Carew |
| Wood Deterioration and Decay ..... | G. R. Warren, J. P. Meades, A. L. Fudge |
| Computer and Statistical Analysis ..... | R. G. Hunter, B. E. Galloway |
| Forest Insect and Disease Survey ..... | L. J. Clarke, K. E. Pardy, E. D. Banfield, D. S. O'Brien W. J. Sutton, D. M. Stone |

## Forestry Development Branch

A/Program Director - J. M. Butler

| | |
|---|---|
| Senior Economist | G. Milne (Educational Leave) |
| Economist | D. Hayden |
| Senior Development Officer | Vacant |
| Forest Development Officer | W. L. Alexander |
| Forest Development Officer | L. R. West |
| Secretary | M. A. Grandy |

## Information and Technology Transfer Services

Head - D. R. Rex

| | |
|---|---|
| Public Information | L. -A. Browne (term) |
| Information Clerk | P. A. Libbey (term) |

## Management Services

Regional Manager - R. J. Angel

| | |
|---|---|
| Finance | W. F. Walsh, E. C. Higdon, M. A. Martin, C. G. Prior |
| Purchasing | F. L. Bannister, J. J. Healey |
| Personnel | J. A. Macfarlane |
| Library | C. E. Philpott |
| Central Registry | L. J. Fennelly |
| Office Services | M. F. Gillingham, E. Cooper, H. Dunphy |
| Field Station Facilities | W. V. Bonnell |

## Newfoundland Forestry Centre
## Expenditures ($000) 1986-87

| Program Areas | PY | Salaries | Development Agreement | Development Agreement O&M | Challenge '86 | ENFOR | PRUF | O&M | Capital | Job Creation | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Management | 2.0 | 91.4 | | | | | | 29.4 | | | 120.8 |
| Administration | 15.89 | 413.0 | | | | | | 256.4 | 484.6 | | 1,154.0 |
| Forest Resources | 22.21 | 1,005.0 | | | 33.7 | 52.5 | | 188.9 | | | 1,280.1 |
| Forest Protection | 22.99 | 998.1 | | | 30.7 | | 153.9 | 182.6 | | | 1,365.3 |
| Forest Development | 5.38 | 214.7 | 7,225.0 | 124.4 | | | | 30.1 | | 32.0 | 7,626.2 |
| Technology Transfer/ Information Service | 1.34 | 54.1 | | | 3.4 | | | 65.6 | | | 123.1 |
| Total | 69.81 | 2,776.3 | 7,225.0 | 124.4 | 67.8 | 52.5 | 153.9 | 753.0 | 484.6 | 32.0 | 11,669.5 |

## Research Project Contracts 1986-87

| Contractor | Title | Amount ($) |
|---|---|---|
| Highlands Contracting<br>01k24-6-0005 | Establishment and maintenance of Experimental Plantations of Selected Willow Clones | $ 45,000.00 |
| Delta-T Documents<br>01k24-6-0010 | Bioenergy R & D Seminar | 5,411.40 |
| Abitibi-Price Inc.<br>01k24-6-0008 | Reforestation of Areas harvested for Biomass | 11,000.00 |
| Northland Associates Ltd.<br>01k24-6-0052 | Calibration of the Forcyte Growth model | 30,000.00 |
| Barbara Dowsley<br>01k24-6-0015 | Study of Photosynthetically active radiation and leaf development in a Salix energy Plantation | 13,000.00 |
| Memorial University of Newfoundland<br>01k24-6-0139 | Investigations to determine . . . other nematodes Pathogenic to trees in Canada | 51,546.37 |
| Memorial University of Newfoundland<br>01k24-6-0138 | Determination of parasite . . . of Newfoundland and Labrador | 23,006.79 |
| Memorial University of Newfoundland<br>01k24-6-0059 | Monitoring of the fate . . . in Lentic habitats in Newfoundland | 75,297.43 |

Publications

# Publications


Bartlett, R. F. 1986. A survey of applied linear regression analysis. Contract report to NeFC. 136 pp.

Bowers, W. W. 1986. Ecology of *Polygraphus rufipennis* in Newfoundland. Presented at the Forest Insect Work Conference, Albany, N.Y. March 13, 14, 1986 (Abstract printed in Proceedings).

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Finney-Crawley, J. R. 1987. Development of locally isolated parasitic nematodes for control of forest pests in Canada. Final Report to the Newfoundland Forestry Centre, 38 pp.

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